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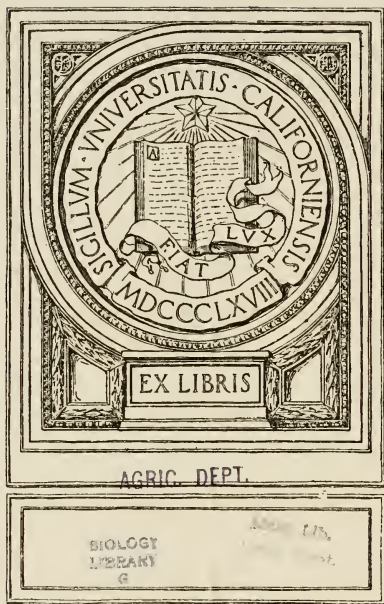
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TENNESSEE
DEPARTMENT OF AGRICULTURE

HOG CHOLERA AND SERUM TREATMENT

1914

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HOG CHOLERA *and* SERUM TREATMENT

FARMERS' BULLETIN



DEPARTMENT OF AGRICULTURE
STATE OF TENNESSEE

T. F. PECK,
Commissioner.

G. R. WHITE,
State Veterinarian.

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INTRODUCTION.

It was only a few years ago when no less than fifty-one counties in Tennessee were in rigid quarantine—both Federal and State—on account of the widespread prevalence of the Southern or Texas fever tick.

Not over five years ago that great scourge to the sheep-raising industry—"scab"—invaded the flocks of the Volunteer State.

Unceasing warfare on the "tick" by the State and Federal Governments in cooperation with the county authorities eradicated the tick, and the State has been released from quarantine and the markets of the world opened up to our Tennessee-raised cattle. The day will never come again when our farmers will be called upon to sacrifice their cattle on account of either State or Federal restrictions against their free movement to market centers. One of the first official acts of the Department of Agriculture after the induction of Capt. Thos. F. Peck into the Commissioner's chair was a determined assault by State, Federal, and county authorities (eleven counties in Middle Tennessee) upon the sheep scab mite, and within as short a time as sixteen months our flocks were again free from "scab," and instead of Tennessee going into quarantine as was threatened, the markets of the world remained open to the sheep raisers of this State.

FUTURE POLICY OF THE DEPARTMENT.

Since Texas fever in cattle and "scab" in sheep have been eradicated, it now behooves us as loyal Tennesseans to make an assault upon that great scourge to our swine-raising industry—hog cholera. While this department will endeavor in every way possible to prevent the spread of, and eradicate, glanders, bovine tuberculosis, lump jaw, black leg, and other contagious and infectious diseases of animals, it shall be our purpose and policy for the next two years to wage unceasing warfare upon hog cholera, and most of our energy and effort will be devoted to the study, control and ultimate eradication of this *one* disease.

ANTI-HOG-CHOLERA SERUM PLANT.

In compliance with an Act of the Fifty-eighth General Assembly, we have caused to be erected and equipped an Anti-Hog-Cholera Serum Plant. This plant is located at 1502 Clinton Street, Nashville, Tennessee, and has been constructed and equipped according to modern sanitary and hygienic requirements. Experts who have visited and inspected the plant pronounce it complete and perfect in all its appointments. It has a capacity of 450 hyperimmunes, which are

capable of yielding no less than 1,000,000 average doses of serum annually. The Dorset-Niles method is employed in producing the serum.

Reports from numerous swine owners and others who have used State-made serum would indicate that they were almost unanimous in attesting to its great value. Of course, as we fully expected, a few failures have occurred and some mistakes have been made. Enough work has already been done in Tennessee with "State-made serum" to convince us that this serum possesses as high a degree of potency as any serum yet produced. When we pause to consider results from every angle we feel much encouraged with what has already been accomplished, and the outlook for the future is exceedingly bright. We positively know that more dollars' worth of hogs have already been saved in Tennessee by serum treatment than the plant cost the State. Since November 1, 1913 we have produced over 3,000,000 cubic centimeters of serum. This serum has been shipped out on 1,950 different orders and has been used in over 1,500 herds of hogs, by 1,200 men who have visited the plant and there received the necessary instructions to entitle them to Virus Permits.

Our object in publishing and distributing this illustrated Bulletin is to acquaint Tennesseans with hog cholera in all its phases, also the facilities which have been placed at our disposal by the General Assembly for the purpose of combating the ravages of that great scourge to the swine industry in the Volunteer State.

Every swine owner and all other persons who are interested in the protection and development of the swine-raising industry are cordially invited to visit this plant and become familiar with the methods here employed in the manufacture and use of anti-hog-cholera serum.

Five thousand copies of a somewhat similar bulletin to this one has already been printed and distributed. This, the second edition—5,000 copies—has been revised in many material respects, and we offer it with the hope that our efforts will meet with the approval of a majority of the Tennessee swine owners, and that the publication will, in a measure at least, assist them in solving this, the greatest economic problem confronting them today.

GEO. R. WHITE, M.D., D.V.S., *State Veterinarian.*

State Capitol, Nashville, Tenn., August 10, 1914.

PART I.—HOG CHOLERA.

I am often asked the question, What is hog cholera? About the best answer I am able to give at this time would be that hog cholera is an acute, subacute or chronic contagious disease of hogs caused by a filterable virus, the specific micro-organism ("germ") of which has never yet been isolated or described by any laboratory or field worker. It is characterized by extreme contagiousness and a high death rate, and does not affect any animal except swine.

ANNUAL LOSSES IN UNITED STATES FROM HOG CHOLERA.

Swine values in the United States total many thousand over one billion dollars. Authorities claim—and I believe justly so—that the annual losses from the ravages of cholera in this great country of ours amounts to between fifty and sixty million dollars. This is to us a tremendous drain in the way of actual losses. It is appalling when we pause to think that cholera is a preventable disease and one easily and cheaply controlled.

ANNUAL LOSSES IN TENNESSEE FROM HOG CHOLERA.

The 1910 Federal Census gives Tennessee 1,386,050 head of swine, valued at \$7,320,377.00. By what we consider a conservative estimate based upon reports of reliable and well-informed men from most every county in the State and from our own personal observation and other dependable sources of information, we have claimed, and do now state, that no less than 400,000 hogs, valued at \$2,250,000.00, died in Tennessee during the year 1912 from hog cholera.

THE INDIRECT LOSSES.

Any disease which causes such money losses in one year in a State as small in area as Tennessee certainly deserves the most careful consideration from all persons who are either directly or indirectly involved. With those 400,000 hogs that died last year from cholera made into bacon and lard some part of the present high cost of these two essentials to our existence would be solved. The control and eradication of hog cholera does not by any means involve or concern or affect the pocketbook of the swine owner alone, but every meat consuming citizen has a share—from an economic viewpoint—in the success of such an undertaking. Since the price of pork and pork products are based upon supply and demand, it is logical to conclude that for every hog that dies from cholera there is one less hog with which to feed the people.

Two million two hundred and fifty thousand dollars represents only

the direct annual losses. The indirect losses caused by discouragement of the swine-raising industry amounts to equally as much as the direct losses.

If cholera was not dreaded, it is quite probable that instead of only 1,386,050 head of swine, Tennessee would be producing at least 3,000,000 head. Many farmers who are now raising only a few hogs each year would raise many if cholera was not feared. I know of at least one breeder who stated to me that he had tried hard to raise two hundred hogs a year, and that "cholera wiped them out at least two years out of every five." Sometime ago he took it upon himself to investigate the efficiency of the Dorset-Niles Anti-Hog-Cholera Serum. After investigating, he was impressed with its merits and later stated that instead of trying to raise two hundred hogs a year he expected in the future to raise one thousand, and that he expected to make it a point to know that each one of them was an immune.

HISTORY OF THE DISEASE.

The first outbreak of hog cholera about which we have any authentic data occurred in the State of Ohio in the year 1833. Since that time it has spread to every State in the Union and throughout almost every European country. Its first occurrence in England was in 1862, where it has since appeared from year to year, causing in one year (1896) the loss of as high as 30 per cent of all swine in that country. It appeared in Sweden in 1887; Denmark in 1889, at which time it also made its first appearance in France. It reached Hungary in 1895. The losses in these foreign countries appear to be equally as heavy as those in the United States. There has been only a very few outbreaks of hog cholera in Canada, hence Canadian laws in regard to importation of swine from the United States are very rigid, as the authorities there hope by this means to prevent cholera gaining a foothold in Canada.

SUSCEPTIBILITY OF BREEDS.

Although some breeds have been lauded and advertised as being "*immune to cholera*," I have no hesitancy in stating that all breeds are about equally susceptible, the "mule-foot hog" not excepted.

Pigs after weaning and young shoats are more susceptible than the older hogs.

Our old friend the "razor-back" is just as susceptible to cholera as is the Poland China, Berkshire, Hampshire, Duroc Jersey, Yorkshire or Tamworth. No breed will withstand the onslaught of cholera infection

MORTALITY.

In localities where the disease appears the first time the death rate will reach from 80 to 95 per cent. In isolated instances 100 per cent of them die.

In communities where cholera is more or less prevalent from year to year the death rate may be as low as 30 to 50 per cent. The disease is more fatal to young hogs and those kept in unsanitary surroundings.

If any considerable number of hogs die on a farm or in a community from contagious or infectious disease, we feel safe in suggesting hog cholera as the disease causing the losses. Cholera is the only contagious disease of swine now prevalent in Tennessee.

PRESENT STATE REGULATIONS.

All swine owners should acquaint themselves with State regulations pertaining to hog cholera, which are as follows:

"Sec. 30. That all public stock yards in the State are hereby placed in quarantine—as regards the handling of swine—and all persons, firms or corporations are prohibited from removing swine therefrom for any purpose other than immediate slaughter.

"Sec. 31. Hogs infected with or exposed to cholera shall not run at large or be driven on ranges, commons or public roads; such hogs must be confined in strict quarantine. Carcasses of hogs that have died of cholera must be sent to a rendering tank, or completely burned on the premises."

The statutes of Tennessee prescribe that carcasses of hogs which die from cholera shall be **BURNED**.

PERIOD OF INCUBATION.

The period of incubation, which means time from actually contracting the disease to time first symptoms or evidence of sickness appears, varies from four days to four weeks, depending upon the susceptibility of the individual animal and the virulence and manner of the infection.

An active or acute attack of sickness indicates that the period of incubation was short and the infection highly virulent. A chronic type of cholera is indicative of a long incubation period and an infection low in vitality. The period is usually from seven to fourteen days.

SYMPTOMS.

Since cholera occurs in three different forms—acute, subacute and chronic—the nature and character of the symptoms naturally vary



Fig. 1—Group of Cholera Pigs.

to a very decided degree, even in individual animals belonging to the same herd.

At the beginning of an outbreak in a herd we usually observe only one or two animals showing evidence of sickness. There is nothing particularly characteristic in the signs of sickness displayed and the presence of so grave a disease as cholera may not be suspected until a week or two later when other hogs in the herd become sick. Of course as the number of sick hogs increase there is an increase in the amount and virulence of the infection, hence increased opportunities are offered for the well animals to contract the disease.

Acute Form.—This is by far the most common type met with in field work. At the beginning the temperature is elevated from two to four degrees or even as high as six degrees. Since the normal temperature of a hog is 102 to 103 degrees, this would mean that in cholera cases the temperature would be 104 to 108 degrees. The temperature of a hog may be taken per rectum with a pear-shaped bulb thermometer, and above 104 degrees in cholera-infected herds would indicate sickness from cholera. On account of the high temperature, loss of appetite, lassitude and marked depression are among the first symptoms presented. Vomiting is frequent. Usually the hog strolls off from the remainder of the herd, selects a quiet place and lies down, sometimes hides by covering itself with litter such as leaves, straw, etc. The inflammation of the intestines and soreness in the abdominal walls causes arching of the back, tucking up in flanks, stiffness in hind quarters and loins, often causing a crossing of the hind legs when the animal moves about. When handled the pig has a peculiar squeal and very little strength or power of resistance and is easily exhausted and depressed.

There is a muco-purulent secretion from eyelids which causes them to adhere together. Reddish blotches or spots oftentimes appear in the skin behind the ears, under the abdomen and neck. These skin lesions are particularly noticeable in hogs with light-colored skin. Constipation alternates with diarrhea. The color of the feces depends upon the character of food which the hog has eaten. Thumps is a frequent symptom, so is quickened breathing and cough. As the disease progresses the symptoms become more well marked by the hog becoming extremely weak and depressed and finally coma and death. The losses from acute cholera will vary from 50 to 75 per cent. However, those which survive an acute attack will go into the subacute and sometimes the chronic forms.

Subacute Form.—This is the form that the disease assumes after

the animal has been sick for eight to twelve days. There is muscle soreness, dry skin, catarrhal discharge from eyes, watery bowel discharges, loss of appetite, cough, depression, etc.

Chronic Form.—When the animal lives from twelve to thirty days it is referred to as the *chronic form*, in which we observe irregular appetite, emaciation, weakness and general unthriftiness and indigestion. The inflamed reddish blotches and “spots” on the skin may become dry and hard, resulting in sloughing and sores. Sloughing of the tail and ears and loss of hair are by no means infrequent sequelae of hog cholera in the chronic form.

The symptoms of cholera may be summarized as follows:

1. Failure to come up for feed or refusal to eat.
2. Huddling together in pens or nests.
3. Cough.
4. Stiffness indicated by staggering gait.
5. Discharge from eyes and sticking together of eyelids.
6. Redness of skin, especially noticeable in white hogs.
7. Rise of temperature.
8. Constipation alternated by profuse diarrhea.

A casual or even careful examination—by the average stockman or even the experienced graduate veterinarian—of a hog sick from cholera does not reveal sufficient information to justify an unreserved diagnosis of this disease. Experience has led us to believe that a thorough post-mortem examination is imperative in order to establish a trustworthy diagnosis. Whenever it is decided to determine the cause of sickness or death in a hog the carcass should be carefully opened up, in which event one or more—sometimes all—of the following lesions will be observed if cholera be the cause.

INTERNAL LESIONS YOU MAY EXPECT ON POST-MORTEM EXAMINATION

Whenever hogs have begun to die on a farm the owner should take immediate steps to diagnose the disease. The best method of diagnosis is to carefully examine the carcass for lesions of disease.

In hog cholera the following post mortem changes may be looked for. It must be remembered that all of these lesions may not be found in any one hog.

Skin.—Red or purple spots may be observed on the hairless parts of the body, especially in the skin of light-colored hogs. Look for these skin lesions under the belly, between the hams and behind the shoulders. In long standing or chronic cases the skin may crack and the ears and tails slough off.

Stomach.—Congestion on mucous lining, and hemorrhagic spots may be in evidence.

Lymphatic Glands.—Darkish red discoloration on the surface and hemorrhagic spots when these glands are cut into.

Large Intestines.—Hemorrhagic spots and congestion in mucous lining in acute and subacute form. Ulcers of various sizes and shapes in chronic form. These ulcers are diagnostic lesions of cholera, as in no other disease do they appear.



Fig. 2—Ulcers (Large Intestine) Chronic Form.

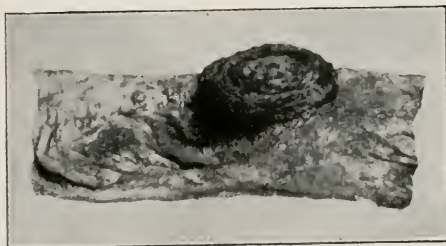


Fig. 3—"Button Ulcers" (Large Intestine) Chronic Form.

Small Intestines.—Changes here are extremely slight and not apparent to the casual observer in but a few exceptional cases.

Spleen.—Sometimes enlarged and discolored.

Kidneys.—When the capsule (covering) of the kidney is removed by stripping, small dark red spots are observed. Sometimes these kidneys are as spotted or speckled as a turkey egg. The finding of spots of this character is pathognomonic evidence of hog cholera, as no other disease produces them.

Lungs.—Certain portions of the lobes of the lung may be discolored and solidified, not resembling in any particular the normal or

healthy lung, which is light pink in color. The lung surface often presents hemorrhagic spots and congested areas varying in size from a pinhead to a dollar. In chronic cases pus may form and the lungs may be adhered to the chest walls.

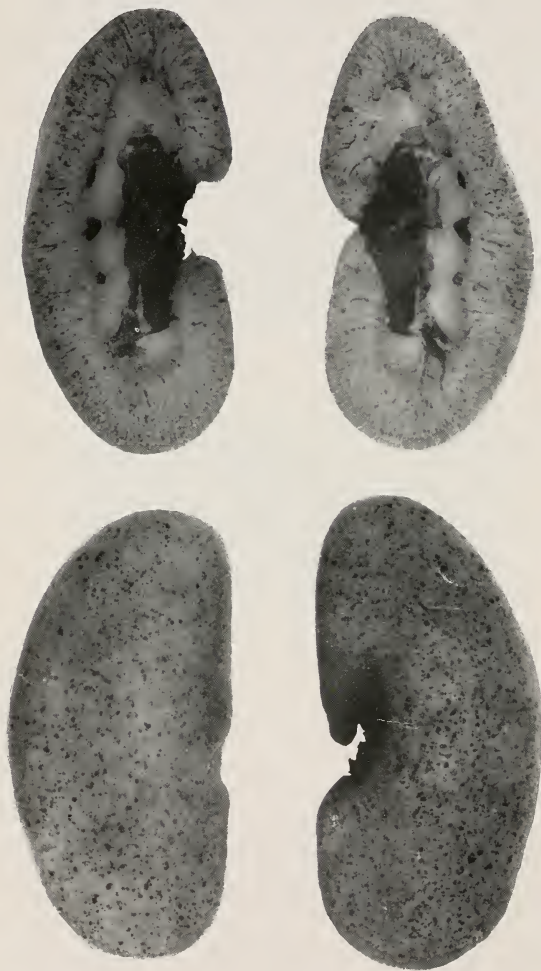


Fig. 4—Kidney Lesions of Hog Cholera. Observe the speckled or spotted appearance.

Bladder.—Hemorrhagic spots and congested areas on lining membrane of the bladder are by no means infrequent post-mortem lesions of hog cholera.

The kidney, lung, and gland lesions are to be expected in most all well-developed cases of acute and subacute hog cholera. These post-mortem lesions greatly resemble the post-mortem lesions found in typhoid fever of man.

The following tabulation of post-mortem lesions was recently formulated by Dr. Geo. H. Roberts, and since it so nearly conforms to our own findings we herewith incorporate it for the benefit of those who are called upon to diagnose hog cholera:

“Conditions found by post-mortem examination of 100 carcasses of hogs which have had cholera within a period of from six to fourteen days from infection. The writer believes that these cases form a fairly representative list typical of the conditions that may be expected in ordinary post-mortem for acute hog cholera:

Diarrhea present in.....	23% of cases
Skin hemorrhagic in.....	26% of cases
Intestines hemorrhagic in.....	100% of cases
Lymph glands hemorrhagic and enlarged in....	100% of cases
Kidneys hemorrhagic and petechiated in....	100% of cases
Spleen petechiated in.....	100% of cases
Spleen enlarged in.....	2% of cases
Spleen hemorrhagic in.....	96% of cases
Pleural adhesions in.....	3% of cases
Bladder hemorrhagic in.....	27% of cases
Lungs showing red hepatization in.....	13% of cases
Lungs showing gray hepatization in.....	2% of cases
Lungs hemorrhagic in.....	92% of cases
Lungs petechiated in.....	97% of cases
Lungs necrotic in.....	3% of cases
Other diseases present in.....	3% of cases

“Average temperature during disease was 106.8 degrees Fahrenheit.”

DANGER OF RECURRENCE ON INFECTED PREMISES.

Authorities differ as to length of time required for cholera infection to die out on an infected premise. However, it is definitely known that the virus will remain virulent for as long as four months when exposed to drying by ordinary atmospheric conditions. It may be killed much more quickly by exposure to the direct rays of the sun.

The feces of infected animals retain their virulence for sixty-five to ninety-five days. My personal experience would indicate that it is unsafe under the climatic conditions encountered here (Tennessee) to endeavor to raise unvaccinated hogs on a farm or other infected premise until after an interval of at least twelve months has elapsed from the last outbreak. Disinfection of premises as ordinarily practiced is valueless in eliminating the danger of reinfection. In fact, in my opinion, the disinfection of premises by any method or under any circumstances is of doubtful value in controlling cholera infection on a farm. It is often misleading in affording false security from the lurking danger of subsequent outbreaks.

Carbolic acid is not at all efficient in disinfecting premises, pens, cars, etc., where hog cholera infection exists. Cresol Compound U. S. P. in 3 per cent solutions should be used freely. For dipping or spraying the hogs 2 per cent cresol is recommended.

The best advice bearing on this point I am able to give is to do one of two things: either raise "immunes," or retire from the hog-raising business for at least one year—preferably the *former*.

METHODS BY WHICH HOG CHOLERA SPREADS.

Remember that the infection must always come from the outside. The disease never arises spontaneously. The urine is much more virulent than any of the other body secretions or excretions. The feces are also heavily laden with infection. The infection enters through the digestive tract.

The infecting agent of hog cholera is just as virulent and dangerous to hogs as is the virus of smallpox to people. Various animals, such as dogs, rabbits, cats, buzzards, crows, pigeons, and other birds, may carry the germs to another herd. Often when a hog dies the owner thinks little of it and the carcass is allowed to remain in the pen to be eaten by the other hogs. Or the carcass is left in the field as a prey to other meat-eating animals. This hog may have been the first to be infected and die of hog cholera, and by this method of disposition the seed is sown for a good crop of cholera in the neighborhood. In known outbreaks carelessness in the disposition of dead carcasses may result in useless spread of the disease. The germs may be carried on the shoes or clothing of anyone handling the hogs to herds subsequently visited. Stock cars used for shipping hogs are to be considered cholera-infested unless thoroughly cleaned and disinfected.

Visiting Infected Places.—It is dangerous for the swine owner to visit infected places and return to his own herd without at first dis-

infecting at least his shoes. This should be done by washing them with Cresol Compound U. S. P. in 3 per cent solution.

Show Hogs.—Show hogs may bring the germs of the disease to the farm upon their return from fairs and exhibitions. For this reason they should be held in quarantine at least two or three weeks before being allowed to run with the other hogs.

Running Streams.—Running streams, such as rivers, creeks and branches, spread cholera by washing the infection down stream from hog cholera outbreaks above; hence it is unsafe to endeavor to raise hogs where they have access to running water.

Public Roads.—Public roads are disseminators of hog cholera. Hogs affected with cholera are liable at any time to be passing and repassing on these public highways; hence it is unsafe to allow hogs access to public roads.

Public Stock Yards.—Every public stock yard in Tennessee and every other State is permanently infected with the virus of hog cholera, hence no man should ever think of removing hogs from a public stock yard for breeding or feeding purposes. Whenever a hog goes into one of these public stock yards the only safe place for him is direct to the abattoir for immediate slaughter.

The Turkey Buzzard.—Aside from public stock yards, I consider the turkey buzzard directly responsible for most of the outbreaks of hog cholera in Tennessee. If you drag the carcass of a horse or cow or that of any other animal which has died of pneumonia, colic, or any other disease out on the farm and allow this carcass to be consumed by buzzards, the same buzzards which flock there in droves to devour this carcass may have come directly from a hog cholera carcass fifty or even one hundred miles away, bringing the infection to your farm, and starting an outbreak of cholera among your own hogs. This emphasizes the importance of burning or burying all dead animals on the farm. Burning is far preferable to burying.

Many of the Southern States afford the buzzard legal protection. This accounts in part for their great numbers. At one time the buzzard was protected by law in Tennessee. At that time anyone killing a buzzard was liable to arrest and fine. Of course when the law was passed no one had any idea that the buzzard was such a spreader of disease.

Some people are under the erroneous impression that the buzzard at this time has legal protection in Tennessee. For their benefit I will say that the law protecting the buzzard was repealed in 1893. Since that date the buzzard has had no legal protection in this State. Any



Fig. 5.—Turkey Buzzard, a Great Disseminator of Hog Cholera in the Southern States.

person can kill a buzzard without violating any State law. Since this is a fact, every good citizen should do his part toward exterminating the buzzard, as it is a menace to the live stock raising industry on account of being a spreader of not only hog cholera, but black leg, anthrax, and many other contagious and infectious diseases.

If all persons would make it a rule to bury all animals which die on their farm, then there would be no inducement offered the buzzard to visit their premises. Besides being an attraction to buzzards, the stench from foetid carcasses of large animals constitute a public nuisance in any community.

Garbage.—Garbage from hotels, restaurants or even private kitchens is dangerous to hogs on account of uncooked meat scraps which it often contains. Many outbreaks of hog cholera have occurred from this source. If garbage is fed it should always be sterilized by thorough cooking.

Dr. Dorset, in a paper read before the Missouri Valley Veterinary Medical Association in January, 1914, gave the following estimate of the relative productivity of various sources of infection, placing the greatest burden of responsibility upon the human element:

Visitation of neighbors carrying the causative agent on their shoes from infected herds to uninfected herds are responsible for 33 per cent of the outbreaks.

Birds carry the infecting medium in 27.5 per cent of outbreaks.

Dogs are probably responsible for about 6.5 per cent of outbreaks.

Streams carry the etiological factor which is responsible for some 8 per cent of outbreaks; hogs in adjoining premises convey the infection in about 4.5 per cent, escaped hogs in 4 per cent of outbreaks; new stock from infected sources bring the cholera in about 10 per cent of outbreaks, and in some 6.5 per cent of new cases the infection is traceable to local causes due to improper sanitation.

PART II.—ANTI-HOG-CHOLERA SERUM PLANT.

Excerpt from General Appropriation Bill passed by the Fifty-eighth General Assembly:

"To establish a serum plant for the purpose of manufacturing and distributing anti-hog-cholera serum to the swine owners of Tennessee at actual cost of production; said plant to be under the direct super-

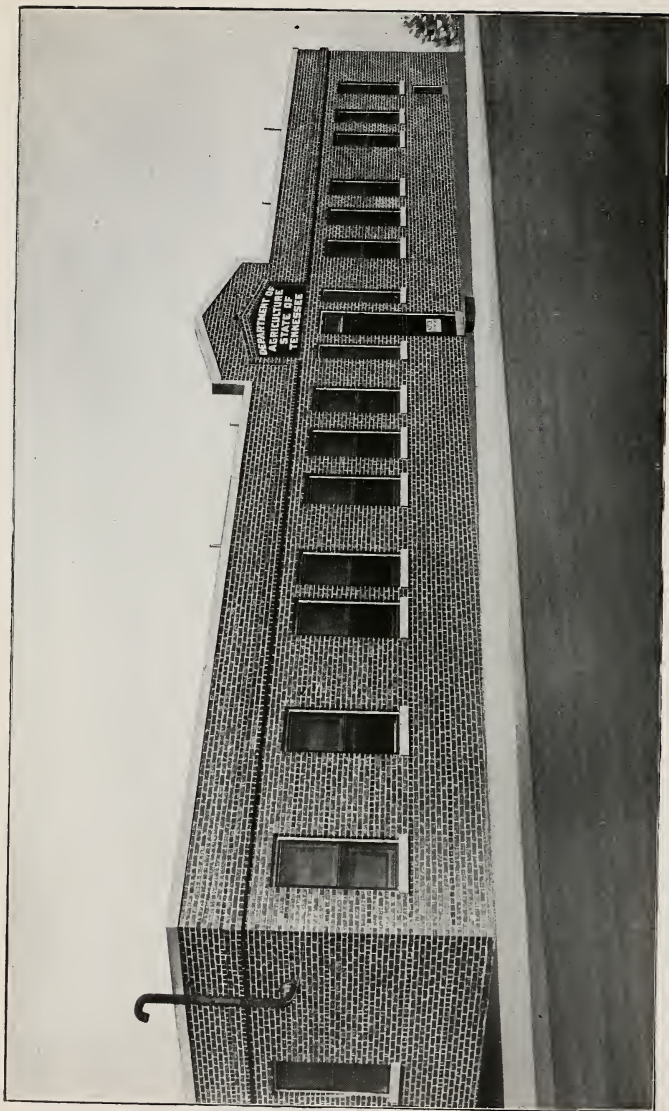


Fig. 6—State Anti-Hog-Cholera Serum Plant, Located at 1502 Clinton Street, Nashville, Tenn.

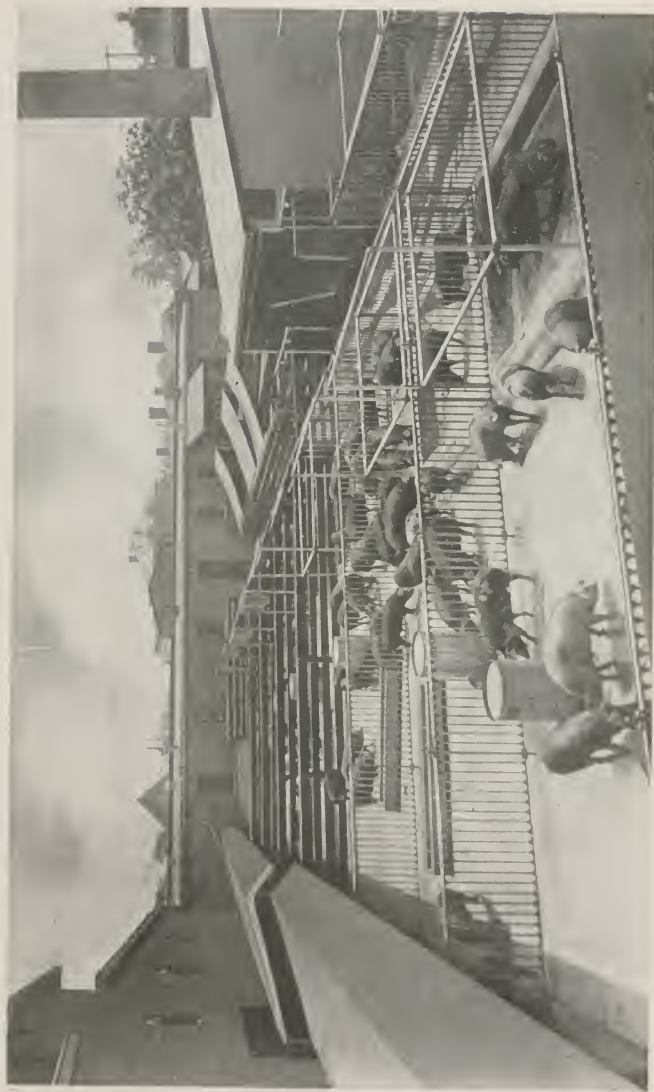


Fig. 7—Rear View of Plant.

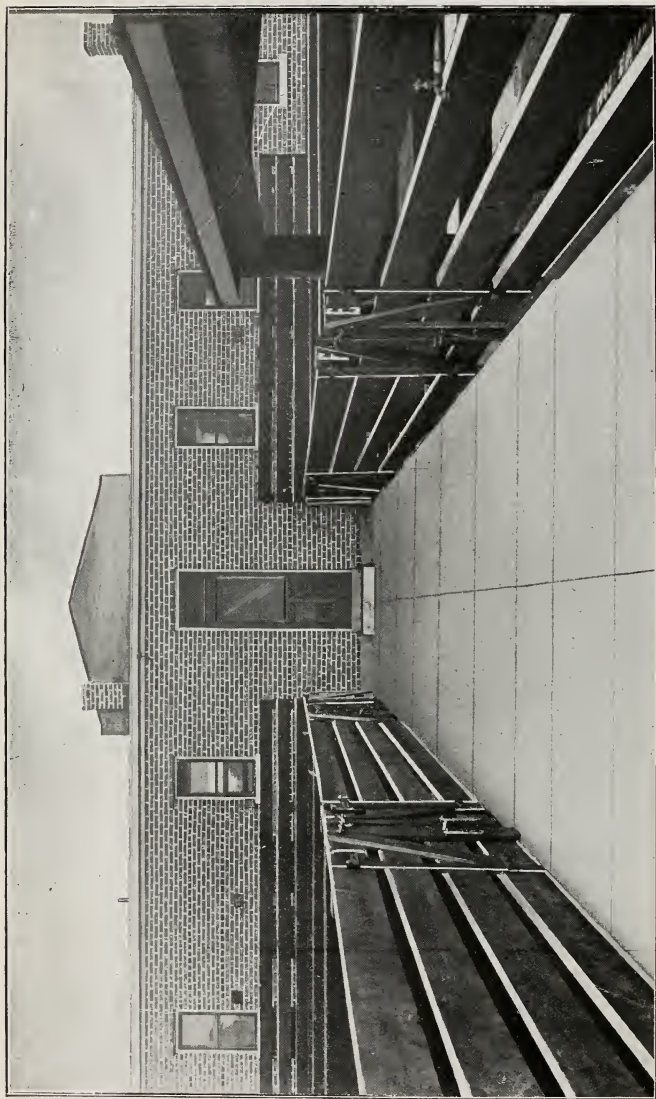


Fig. 8—Rear View, Showing Gate Entrance to Pens and Concrete Alley Way.



Fig. 9—View of the Pens.

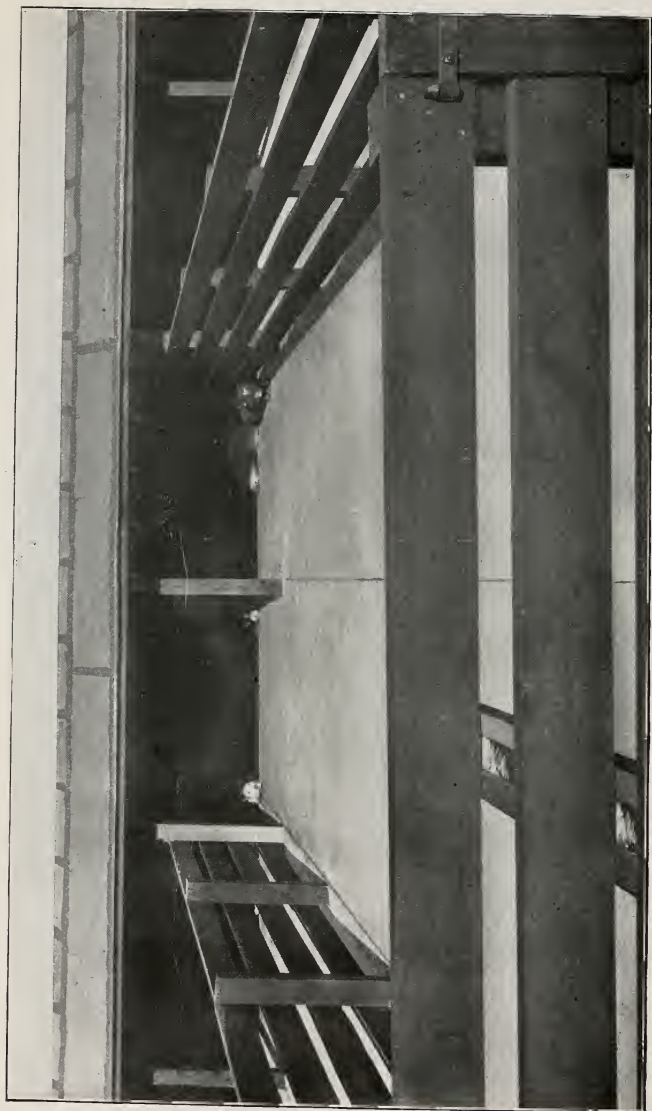


Fig. 10—One of the Pens.



Fig. 11—Concrete Hog Wallow.



Fig. 12—McCall Incinerator Used to Burn Manure, etc.



Fig. 13—Hog Entrance to Operating Rooms.



Fig. 14—Interior View of Plant.



Fig. 15—Office.

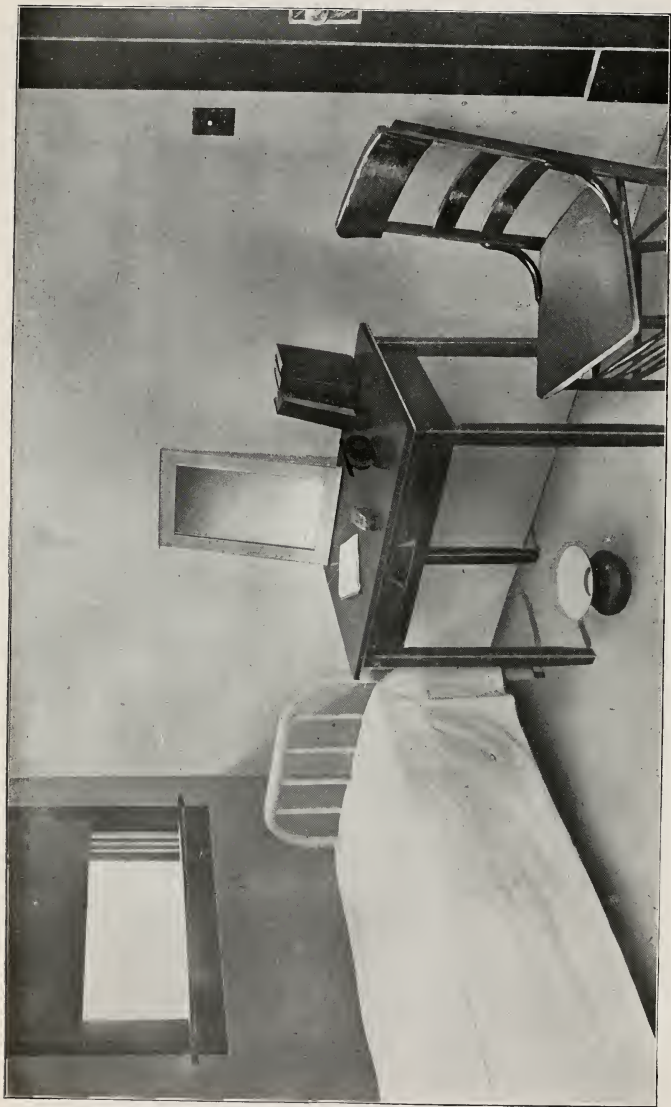


Fig. 16—Bedroom.



Fig. 17—Bleeding for Virus. Hog Fastened to Table,



Fig. 18—Bleeding for Virus. (Neck Incision.)



Fig. 19—Bleeding for Virus.

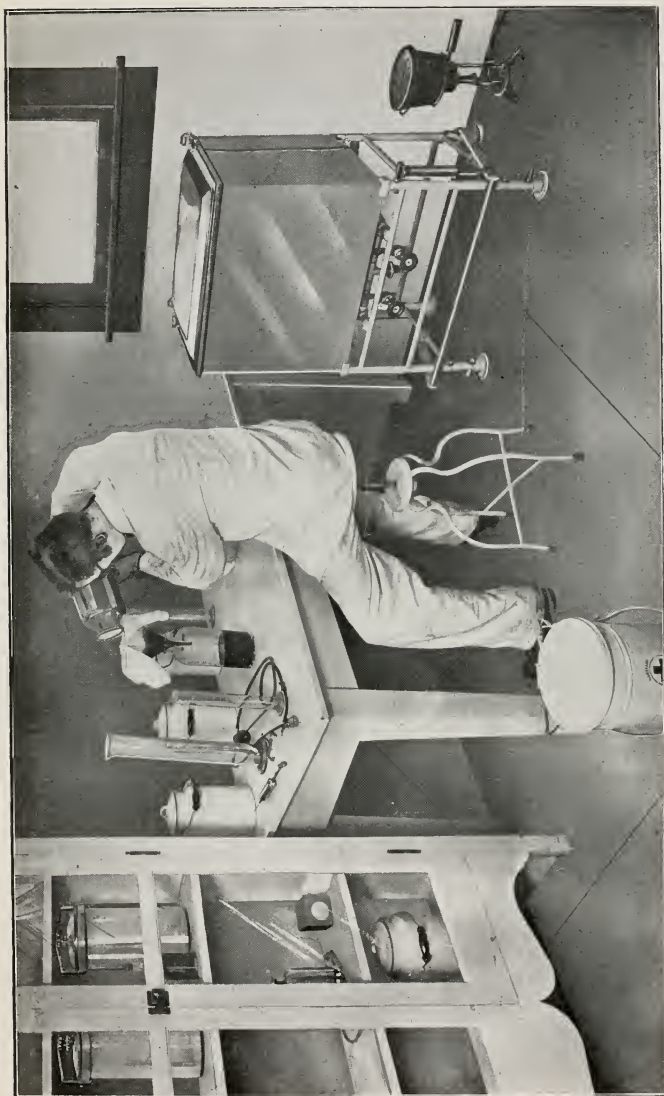


Fig. 20—Virus Laboratory.



Fig. 21—Operating Room No. 1 (Hypering).

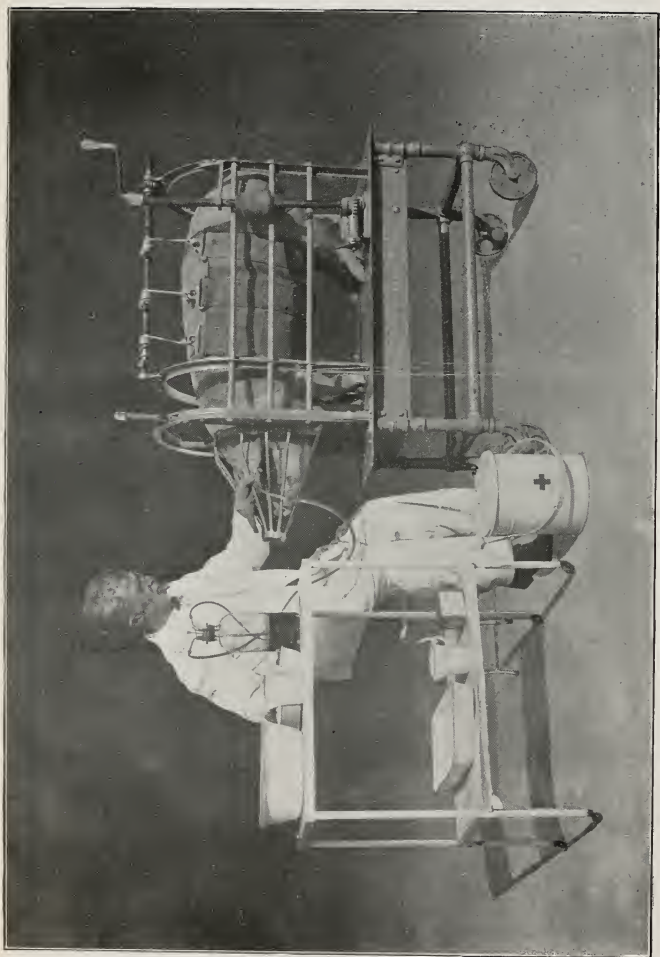


Fig. 22—Intravenous Hypering (Ear Vein).

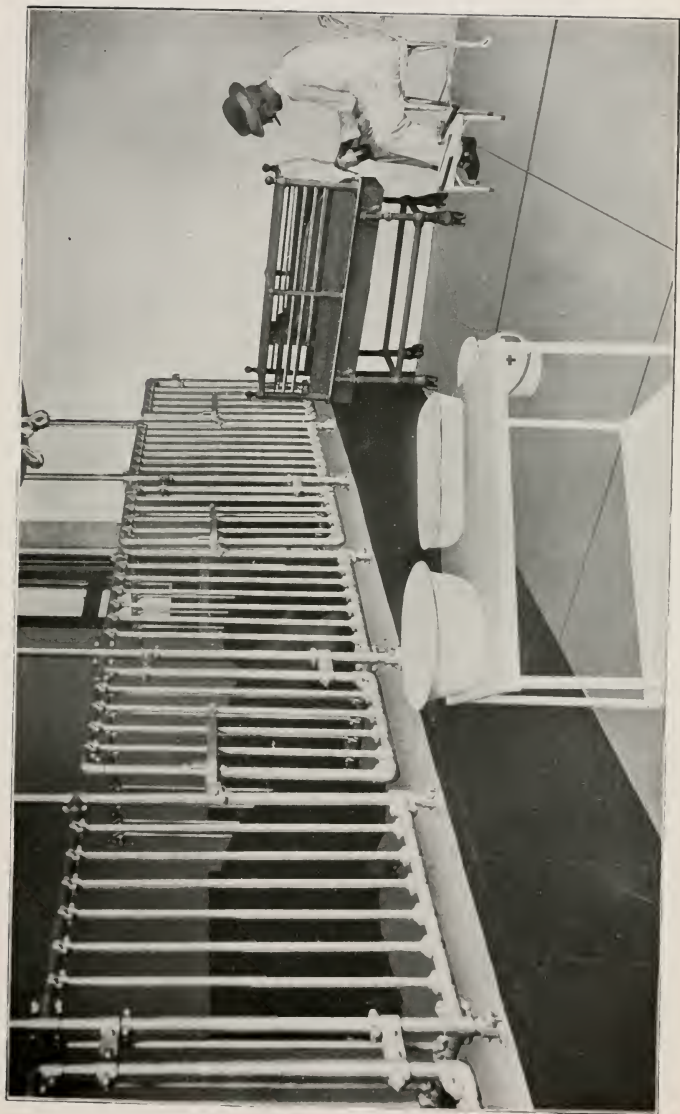


Fig. 23.—Operating Room No. 2 (Tail Bleeding).

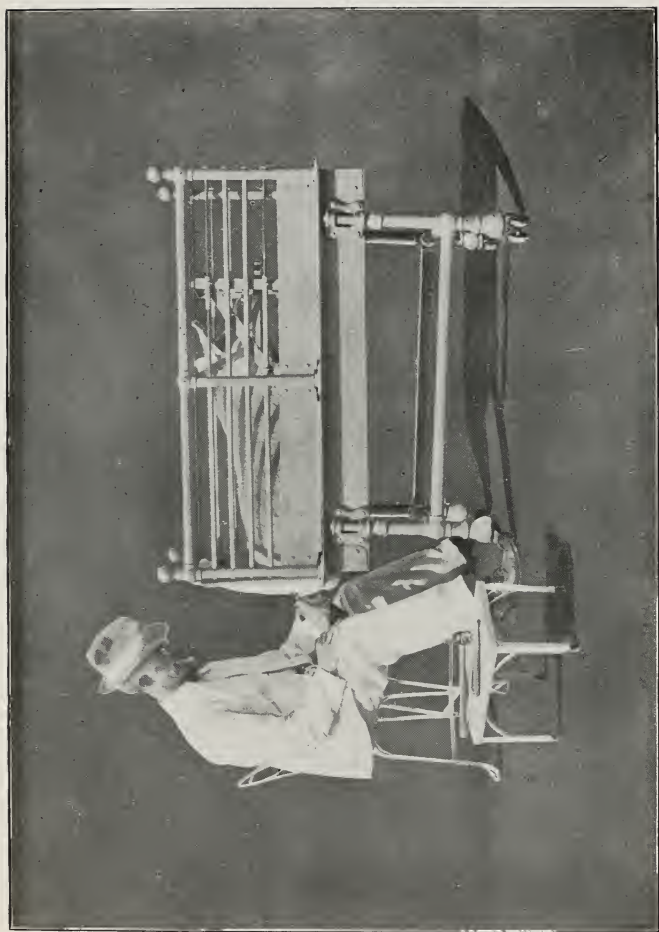


Fig. 24—Tail Bleeding.

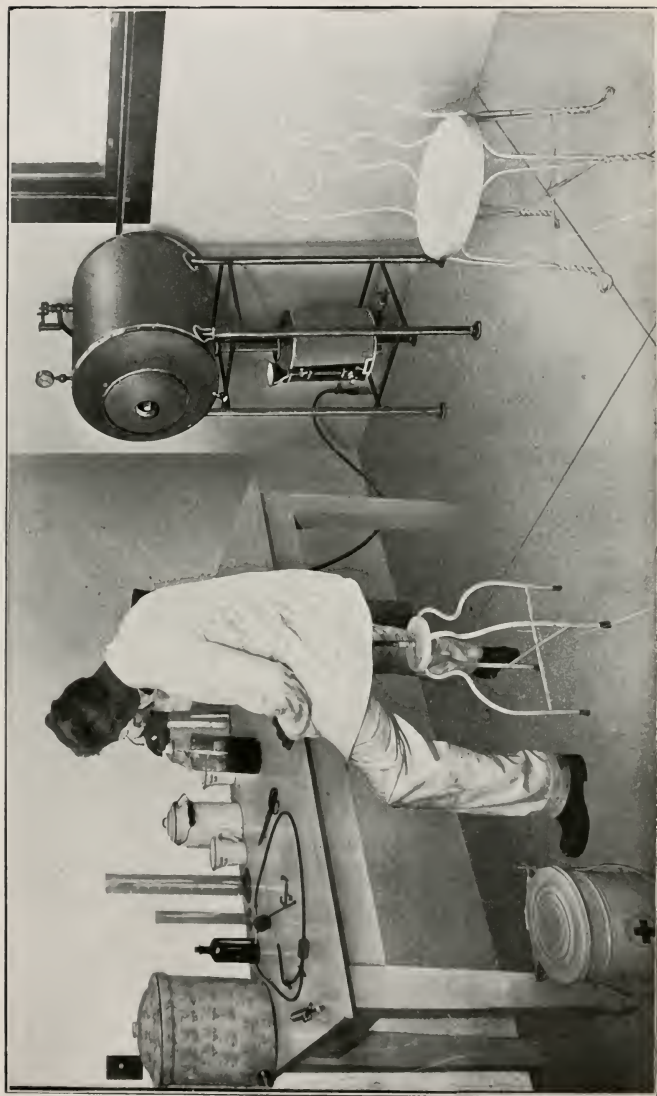


Fig. 25—Serum Laboratory.

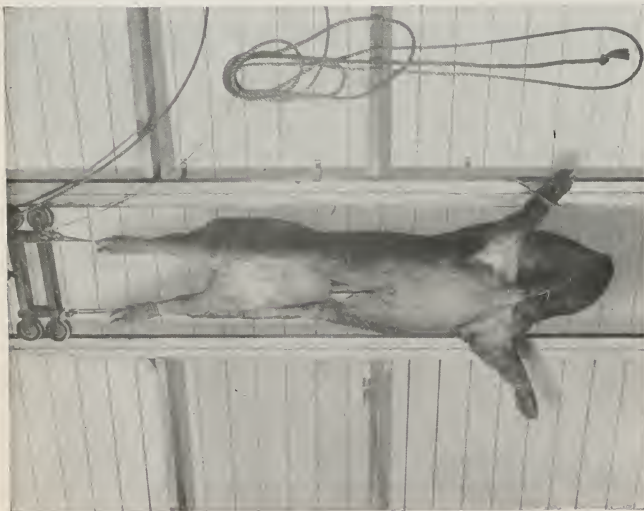


Fig. 26—Final Bleeding in Specially Constructed Slaughter Room at Neuhoﬀ Abattoir.



Fig. 27.—Storage and Shipping Room.



Fig. 28—Automobile for Quick Delivery of Serum to Express Office.

vision of the State Veterinarian. The amount of this appropriation to be paid out of the State Treasury on vouchers approved by the Commissioner of Agriculture. \$10,000.00."

THE PLANT.

The plant is modern in all its appointments. It is fireproof, sanitary, and electric lighted. It is equipped with the most up-to-date fixtures, machinery and laboratory apparatus that money could buy, including cold storage facilities. The sewerage system is complete. The plant fronts 100 feet on Clinton Street, and runs back 175 feet to the N., C. & St. L. Ry. It is within two squares of the Nashville Union Stock Yards, where most of the hog supply is obtained. The pens and hog sheds are substantially constructed with concrete floors throughout. The plant consists of a modern brick building 14x100 feet. This building contains bedroom for attendants, office, hypering room 14x17 feet, virus laboratory 10x14 feet, bleeding room 14x20 feet, serum laboratory 10x14 feet, and storage and shipping room 10x14 feet. It has a capacity of 450 hyperimmunes.

PART III.—PROTECTIVE VACCINATION.

ORIGIN OF THE DORSET-NILES METHOD.

Dr. M. Dorset, together with Dr. W. B. Niles—who conducted most of the field experiments—perfected the Dorset-Niles Anti-Hog-Cholera Serum until now it is well out of the experimental stage. We have no hesitancy in assuring swine owners that this serum when properly made and intelligently administered will protect healthy hogs against cholera under all conditions and circumstances.

To Dr. Dorset, a native Tennessean, belongs the honor and credit of discovering anti-hog-cholera serum. He was born and raised near Columbia, in Maury County, and is now Chief of Bichemic Division of the U. S. Bureau of Animal Industry. Many eminent scientists claim that in the discovery of this method of combating hog cholera Drs. Dorset and Niles have given to the world the greatest discovery known to the science of veterinary medicine. We, as Tennesseans, should at this time be especially appreciative of this great achievement of Dr. Dorset, who has reflected credit and honor upon Tennessee and the nation at large.

Although only four years have elapsed since the Dorset-Niles Anti-Hog-Cholera Serum was perfected there are at this time twenty-three States engaged in making the product. These State plants cost \$299,-

000.00. In addition to the State plants there are no less than seventy-six private or commercial plants manufacturing and distributing serum in the United States.

SERUM PRODUCTION.

To produce potent anti-hog-cholera serum in accordance with the Dorset-Niles method it is necessary to start with an immune hog. To secure this "immune" it is necessary to get a hog which has been injected with serum and virus at least twenty-one days before, or select a hog which has recovered from the disease itself, as it is a well-known fact that when a hog recovers from an attack of cholera he is forever thereafter "immune."

After securing the immune it is necessary to obtain "virus" (blood from a hog on the verge of death from cholera. (See Figs. 17, 18 and 19 for injection into the ear vein of this immune.) The amount of virus necessary to hyperimmune an immune weighing 300 pounds would be 1500 c.c. (approximately three pints). This virus is given intravenously, the ear vein being used. (See Figs. 21 and 22.) After an interval of fourteen days the hyperimmune is bled from the tail. (See Figs 23 and 24.) The usual amount taken should not exceed the amount of "virus" given, which would mean 1500 c.c. from a 300-pound hog. After an interval of seven days the hyperimmune is again bled from the tail. At the end of the next week this hyperimmune is carried to the abattoir for slaughter and final bleeding. (See Fig. 26.)

After the blood from the hyperimmune is secured it is defibrinated by specially-constructed machinery in the serum laboratory of the plant. (See Fig. 25.) To this defibrinated blood one-half of one per cent carbolic acid is added, which acts as a preservative.

ANTI-HOG-CHOLERA SERUM.

Anti-hog-cholera serum is the defibrinated blood (liquid portion of the blood) of a healthy hyperimmune hog. It is impossible for this serum to cause hog cholera, because it is charged with "antibodies" which possess the property of being antagonistic to the hog cholera infection, and will protect or immunize any healthy hog against this disease.

FAKE "SERUMS" AND "VACCINES."

With the advent of the Dorset-Niles Anti-Hog-Cholera Serum a few years ago the most deadly of all swine diseases was doomed to ultimate eradication from the American continent. It is a well-known

and fully-established fact that until then the swine owners' investments in hogs was at all times jeopardized by this disastrous disease.

Long ago all well-informed individuals fully realized that every medicinal treatment for hog cholera which had ever been proposed was worse than worthless in "curing" this disease. The swine owners' pocketbooks were continually being depleted and flattened by so-called "hog cholera cures" of all kinds and descriptions which in reality were nothing more nor less than "fakes" and "frauds" compounded for the purpose of wrenching hard-earned dollars from the honest, though gullible, hog owner.

The press—agricultural press in particular—carried in each and all issues glaring advertisements of numerous so-called "cures for cholera." In spite of the large amounts of money spent for these "fake remedies," hog cholera continued to spread with cyclone-like rapidity. Since the discovery of the Dorset-Niles Anti-Hog-Cholera Serum and its demonstrated and undisputed efficiency the "fakers" have shifted their advertisements from "medicines" to so-called impotent fake serums and vaccines, for which it behooves the farmers of Tennessee to be on the constant lookout.

The Dorset-Niles Serum, when properly made by reliable and well-trained men according to the U. S. Government standards and by other definitely-defined technique of Drs. Dorset and Niles, when properly administered, will undoubtedly protect healthy hogs from cholera. However, the field for fraud and deception is so inviting that the unscrupulous fakers have already invaded it with their worthless "juice" in the form of "vaccine" or "serum." Look out for them, and refuse to allow them to separate you from your hard-earned dollars.

Before purchasing anti-hog-cholera serum from anyone take the precaution of determining whether or not the manufacturer is in possession of a permit from the State Agricultural Department for its sale in Tennessee. Up to August 10, 1914, only seventeen commercial firms have been granted permits to market anti-hog-cholera serum in Tennessee. The names of these firms will be furnished upon application to the State Veterinarian.

At the present time this State is being flooded with advertisements—by mail and otherwise—of at least thirty commercial firms who have something attractive—in price or otherwise—to offer the swine owners for the treatment and prevention of hog cholera. Beware of these and remember that all medicines advertised as "hog cholera cures" are worthless and that 50 per cent of the "serums" and "vaccines" are frauds and are sold and distributed in this State in open violation of law.



Fig. 29.—The White Hogs Were Protected from Cholera by Simultaneous Method. The Unvaccinated Black Hog Died from Cholera. All Seven Received the Same Exposure.

In order to partially protect swine owners in the purchase of serum Congress passed an act making it unlawful to ship serum interstate unless the maker is in possession of a government license. The law also provides that the license number shall appear on the bottle label. If any Tennessee swine owner should chance to get serum without license number being printed on the label he owes it to himself and others to send this bottle when empty, with label intact, to the State Veterinarian at Nashville, who will promptly refer the matter to the proper federal authorities for prosecution.

VIRUS LAW.

In order to protect the swine industry from the indiscriminate use of virus the following Act was passed by the Fifty-eighth General Assembly:

CHAPTER 6, ACTS 1913.

AN ACT to regulate the distribution, sale and use of virulent blood from cholera-infected hogs, or "virus," and to prescribe penalties for violation of same.

SECTION 1. *Be it enacted by the General Assembly of the State of Tennessee*, That it shall be unlawful for any person, firm or corporation to distribute, sell or use in the State of Tennessee, virulent blood from hog-cholera-infected hogs, or "virus," unless and until they have obtained written permission from the State Veterinarian for such distribution, sale or use.

SEC. 2. *Be it further enacted*, That any person, firm or corporation guilty of violating the provisions of this Act, or failing or refusing to comply with the requirements hereof, shall be fined not less than fifty nor more than one hundred dollars for each offense, and may be imprisoned, in the discretion of the court, not less than ten nor more than thirty days, and shall be liable to any person injured on account of such violation to the full amount of the damages and all costs.

SEC. 3. *Be it further enacted*, That this Act take effect from and after its passage, the public welfare requiring it.

HOW TO SECURE VIRUS PERMITS.

It will be observed by reading the above Act that all who distribute or use *virus* in Tennessee without first securing a permit from this department are violating the law. It is our policy to require that persons who visit the plant shall receive the necessary special instruction before issuing virus permit. All interested persons are cordially invited to visit this plant at 2 p. m. each day, Sunday excepted. One hour at the plant will be all the time necessary for proper instruction, and no charge for same will be made. Instruction is free to all residents of Tennessee.

DIRECTIONS FOR SECURING SERUM.

Unless personal check, postoffice order or express money order accompanies order for serum same will be sent by express C. O. D.

Serum and virus will not be sent by parcel post as the postal regulations will not permit it.

In ordering, it will be necessary to designate *express* as well as postoffice. Since virus is perishable, shipments in which virus is included will be packed in ice, and it is recommended that virus be kept on ice until used.

The present price of serum is $1\frac{1}{2}$ cents per c.c., which we estimate is actual cost of production. Virus will be sent free with shipments to persons holding "virus permits" from this department. Virus will not be shipped to unauthorized persons under any conditions.

Serum will be distributed in the following size bottles: 500 c.c., 250 c.c., 100 c.c., and 50 c.c.

On account of the danger of contamination no bottles will be broken and users are advised to order in above sizes or multiples thereof.

In ordering serum by letter or telegram direct same to State of Tennessee, Cholera Serum Department, 1502 Clinton Street; or telephone Main 5247, in which event there will be no delay in shipment. The character of the State Veterinarian's work is such that he is oftentimes out of the city and even State for days and sometimes weeks. Since his mail is not opened during his absence, if orders are directed to him at the Capitol there is a possibility of several days' delay in their delivery to the plant, which of course would mean delayed shipment.

Serum is not returnable.

Serum bottles are labeled as follows:

ANTI HOG CHOLERA SERUM
DEPARTMENT OF AGRICULTURE
STATE OF TENNESSEE
T. F. PECK, COMMISSIONER
G. R. WHITE, STATE VETERINARIAN

THIS BOTTLE CONTAINS _____ C.C.
DOSAGE SIMULTANEOUS METHOD

5 to 15 pound Pigs 10 cc Serum $\frac{1}{4}$ cc Virus
15 to 25 pound Pigs 15 cc Serum $\frac{1}{4}$ cc Virus
25 to 50 pound Shoats 20 cc Serum $\frac{1}{4}$ cc Virus
50 to 75 pound Shoats 25 cc Serum $\frac{1}{4}$ cc Virus
75 to 100 pound Shoats 30 cc Serum $\frac{1}{4}$ cc Virus
100 to 125 pound Hogs 35 cc Serum 1 cc Virus
125 to 150 pound Hogs 40 cc Serum 1 cc Virus
150 to 200 pound Hogs 45 cc Serum $1\frac{1}{2}$ cc Virus
200 to 250 pound Hogs 50 cc Serum $1\frac{1}{2}$ cc Virus
All Hogs over 250 pounds 60 cc Serum $1\frac{1}{2}$ cc Virus

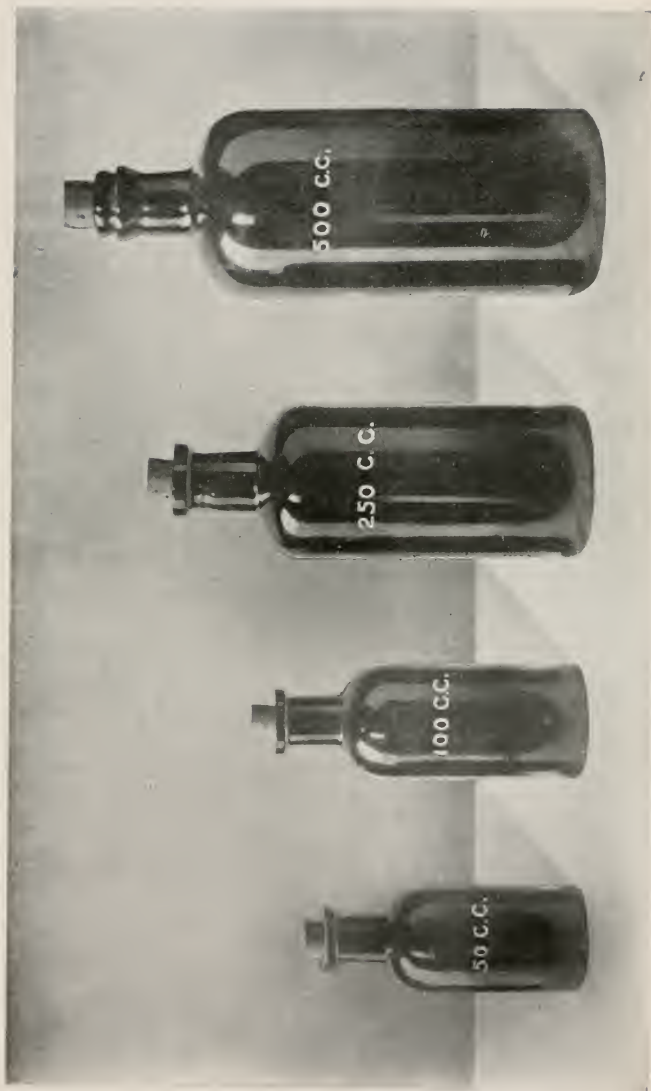


Fig. 30.—Sizes of Bottles in which Serum Will Be Distributed.

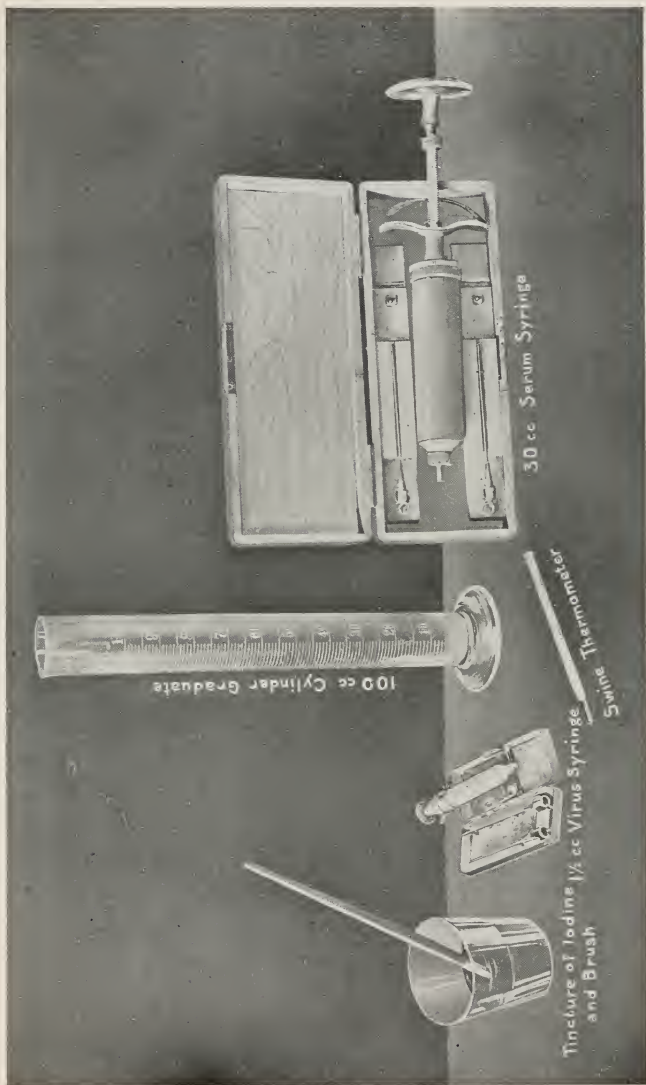


Fig. 31—Instruments and Utensils Used in Vaccinating Hogs.

INSTRUMENTS AND UTENSILS NECESSARY FOR VACCINATING HOGS.

(See Fig. 31.)

30 c.c serum syringe.....	\$3 50
1½ c.c. virus syringe.....	1 50
Swine thermometer	1 00
100 c.c. cylinder graduate.....	50
Total	\$6 50

Extra needles for serum and virus syringes, 25 cents each.

The above are kept in stock and may be secured from the plant at prices quoted.

METHODS OF VACCINATING.

Two methods of vaccinating are in vogue, viz.: serum alone, and simultaneous method. The *serum alone* method means injection of serum without virus. This method only affords temporary immunity—three to six weeks. We do not advocate or even indorse this method as the immunity does not last long enough to justify the expense.

The *simultaneous method* consists in the injection of a small amount of virus at same time serum is injected. This method affords life immunity and does not cost one cent more and does not require one minute additional time than the serum alone method. This *simultaneous method* has our unqualified indorsement and is the only one we advocate.

TIME TO VACCINATE.

The proper time to vaccinate hogs is before they become sick. If you wait until they are standing around with ears drooping, backs arched, noses to the ground, no appetite, hind legs partly paralyzed and temperature above 105, it is certainly too late to save all of them and oftentimes the majority will succumb even in spite of serum treatment administered in double doses.

VACCINATING SUCKLING PIGS.

The protection of young pigs from cholera is the “knottiest problem” which the department has been called upon to solve; however, from our own experience and the experience of others, we are constrained to summarize the young pig problem as follows:

We know that suckling pigs are extremely susceptible to hog cholera and that when they contract it the death rate (mortality) is very high—oftentimes 100 per cent of them die.

We know that it is impossible by any known method of vaccination to get *life* immunity in any large per cent of suckling pigs.

We know that pigs from immuned sows are themselves immune so long as they are subsisting *alone* on their mother's milk, but that as soon as they begin to eat other food—which is at 14 to 18 days of age—they become susceptible to hog cholera.

Looking at it from every phase, our advice is as follows:

1. Unless the pigs are in actual danger of hog cholera defer vaccinating them until they are weaned.
2. If cholera infection is already on the farm or in close proximity thereto you are justified in vaccinating with serum alone.
3. If forced to vaccinate suckling pigs, you should revaccinate after they are weaned in order to insure *life* immunity.
4. A pig is never too young to vaccinate if it is in immediate danger of hog cholera.

TREATMENT BEFORE VACCINATION.

Hogs that are to be vaccinated should be kept in as cleanly and sanitary manner as possible before the operation. This would of course mean that they should be kept away from dust, manure and wallow holes. It is best to have them empty at time of operation as the usual danger attending the handling of "*full hogs*," such as rupture of internal organs, blood vessels, etc., will thereby be eliminated.

Virus bottles will be labeled as follows:

HOG CHOLERA VIRUS	
DEPARTMENT OF AGRICULTURE	
STATE OF TENNESSEE	
T. F. PECK, COMMISSIONER	G. R. WHITE, STATE VETERINARIAN
For Dosage See Label on Serum Bottle.	
CAUTION	
Virus is perishable and should be kept on ice until used.	
The dose should be measured accurately. Extreme care should be exercised in disposing of <i>all Virus</i> not used. It should be <i>burned</i> .	
Do not use contents of this package after _____ 191__	

IMPORTANT NOTICE.

Read every word of the following before you ever undertake to vaccinate a hog.

1. Remember that there is a very decided and important distinction between *serum* and *virus*.

Serum is the defibrinated blood of a healthy hyperimmune hog and is incapable of producing cholera.

Virus is the defibrinated blood of a hog sick of cholera and is capable of producing the disease unless used with discretion and extreme care.

2. Virus is perishable and should be kept on ice until used. Don't order "virus" unless you are in possession of a "virus permit." Don't use virus after expiration date marked on bottle label. This date is ten days after virus is drawn from hog. Burn all virus not used. Do not handle virus on public roads, commons or ranges. Don't inject virus into a hog which is already sick. Take temperature per rectum; if the temperature is above 104 degrees it indicates that the hog is sick. Into such a hog inject a double dose of serum—no virus. Inject serum and virus into all hogs showing a temperature below 104 degrees F. The normal temperature of swine is 102 to 103 degrees.

3. Great care and cleanliness is exercised in the manufacture of anti-hog-cholera serum; hence it behooves those who are to use it to use at least ordinary caution in handling and administering it.

4. Serum is preserved with $\frac{1}{2}$ per cent carbolic acid which is, to say the most of it, an extremely weak preservative in this strength, hence in summer serum should be kept in a dark, cool place until used. Keep it in a refrigerator if possible. However, an ordinary cellar temperature is permissible. In winter protect it from freezing. Never expose serum to sunlight or heat from stoves, radiators, steam pipes, etc.

5. Never open more than one bottle at a time, and never pour the contents of this one bottle into any other bottle or vessel. Always pour it from the original bottle directly into a 100 c.c. cylinder graduate in order to accurately measure the dose. From this graduate the syringe is filled by removing cap and piston and pouring directly into barrel of syringe.

6. All instruments and utensils used should be thoroughly sterilized by boiling before use and the hands of the operator cleansed by thoroughly washing.

7. Never underestimate the weight of the hog. Better overestimate the weight, as it is possible to give too little serum, but utterly impossible to give too much.

8. Tincture of iodine is universally recognized as the most efficient skin disinfectant, hence it is recommended that the site of injection be painted with tincture of iodine. Allow about one minute for drying before injection is made.

9. Carefully force all air out of the syringe before making the injection, as air bubbles are calculated to cause abscesses.

10. Serum should remain potent for at least six months if kept in original sealed bottles in refrigerator.

11. Destroy all unused bottles of serum which have been opened.

13. The injection should be made behind the ear of large hogs, especially those which are to be slaughtered within four to six weeks after vaccination. (See Fig. 33.) The site of injection is in the depression behind the jaw, and slightly below and a little behind base of ear. This location is recommended in preference to ham injection, on account of possibility of abscesses following the injection. Another desirable site for injection in large hogs is under the skin in axillary space—depression between chest and elbow. (See Fig. 32.)

14. Never mix serum and virus. Always inject them separately; serum on one side and virus on the other. Use a special syringe for each.

15. Handle pregnant sows with care while vaccinating. The injection of serum and virus will not cause abortion, but rough and careless handling will cause it.

16. After each injection is made immerse syringe in a clean basin containing carbolic acid, one teaspoonful; warm water, one-half gallon.

17. Keep vaccinated hogs in a small lot for twenty-one days after the operation, before they are allowed to mingle with unvaccinated hogs or run at large on public roads, commons or ranges.

18. We recommend immunizing the whole herd, then immunize each litter of pigs at or just before weaning time. This gives protection against cholera at a very reasonable cost. Make it a practice to raise only immune hogs, in which your investments in swine will be almost as safe as U. S. Government bonds. Losses from this disease can be entirely eliminated by maintaining a cholera-immune herd at all times.

19. Pigs from immune sows are themselves immune while they are subsisting alone on the mother's milk. As soon as they begin to eat about the premises they become susceptible to the disease.

20. Do not spill any virus on the premises. That which is not put into the hog should be kept in the bottle.

21. Don't let any person who has not visited a serum plant and there received special instructions vaccinate your hogs, and don't attempt to do so yourself without receiving the necessary instructions. People are not born with knowledge of this kind. It must be acquired and the best place to acquire it is at a serum plant under direction of an expert in this line of work.

22. Serum is a protective agent against cholera. It will prevent cholera in 100 per cent of cases. We do not here lay any claim for it being a specific treatment for hogs already sick of the disease. However, we feel safe in saying that even in sick herds the losses after proper vaccination will not exceed 50 per cent. Don't wait until they are sick to vaccinate, as at this time it requires large doses of serum and is otherwise expensive. The proper time to vaccinate is before the pigs exceed twenty-five pounds in weight, as at this period they only require a small dose of serum and can be protected for life at an expense of twenty-five cents per head.

23. Avoid exciting and crowding hogs before treating, as this tends to increase the temperature.

24. Wash mouth of bottles before opening.

26. Fig. 33 shows proper method of restraint for large hogs.

28. Avoid the bone when inserting the needle.

29. Have helpers to catch and hold the hogs. The operator should confine himself to the actual operation.

30. Don't hurry.

31. Don't expect anti-hog-cholera serum to protect hogs against cottonseed meal poison, lye poison, pneumonia, etc., as it will not do it. It is made to protect hogs from cholera, and none other.

32. With proper assistants one man can easily vaccinate 150 to 250 hogs in ten hours.

33. Don't vaccinate hogs for ten days after castration or any other surgical operation, and do not castrate or perform any other surgical operation for ten days after vaccinating. Of course, where the hogs are in immediate danger of cholera infection, the above does not apply.

34. Pigs are never too young to vaccinate, by either the serum alone or simultaneous method, if they are in danger of cholera infection. Be sure and give very young pigs enough serum. It requires more serum in proportion to weight to protect young pigs than older hogs.

35. Don't fail to take temperatures in sick herds.



Fig. 32—Injecting Serum Behind Shoulder (Large Hog).



Fig. 33—Injecting Serum Behind Ear (Large Hog).

DIRECTIONS FOR VACCINATING.

1. Sterilize instruments by boiling.
2. Wash your hands.
3. Carefully estimate weight of hog.
4. Restrain the hog by holding or otherwise. (See Figs. 32 and 33.)
5. Paint site of injection with tincture of iodine.
6. Wash mouth of serum and virus bottles.
7. Measure amount of serum with graduate and pour serum into barrel of syringe.
8. Replace syringe piston and cap.
9. Fill virus syringe with required amount of virus. See label on serum bottle.
10. Inject serum behind ear or behind shoulder of one side and virus on the other side. If more than one syringeful is to be used, withdraw the needle and make the second injection on opposite side, in which event virus should be injected into some other site. (See Figs. 32 and 33.)

DOSE TABLE.

DOSAGE SIMULTANEOUS METHOD IN HEALTHY HERDS.

5 to 15 pound pigs—	10 c.c. serum, $\frac{1}{4}$ c.c. virus.
15 to 25 pound pigs—	15 c.c. serum, $\frac{1}{2}$ c.c. virus.
25 to 50 pound shoats—	20 c.c. serum, $\frac{1}{2}$ c.c. virus.
50 to 75 pound shoats—	25 c.c. serum, $\frac{3}{4}$ c.c. virus.
75 to 100 pound shoats—	30 c.c. serum, $\frac{3}{4}$ c.c. virus.
100 to 125 pound hogs—	35 c.c. serum, 1 c.c. virus.
125 to 150 pound hogs—	40 c.c. serum, 1 c.c. virus.
150 to 200 pound hogs—	45 c.c. serum, $1\frac{1}{2}$ c.c. virus.
200 to 250 pound hogs—	50 c.c. serum, $1\frac{1}{2}$ c.c. virus.
All hogs over 250 pounds—	60 c.c. serum, $1\frac{1}{2}$ c.c. virus.

The dose of serum prescribed above is the minimum amount which will protect, and the virus dose prescribed is the maximum amount which hogs will stand with safety. In sick herds we urgently recommend one-third to one-half increased dose of serum, even though the temperature is not elevated sufficiently to indicate actual sickness. We believe by following this suggestion a much larger per cent of hogs in such herds will be saved than there would had the dose not been increased.

11. After finishing a job of vaccinating all instruments and utensils should be thoroughly washed and dried. The syringe pistons should be lubricated with 3 in 1 Oil to prevent sticking to barrel.

AFTER TREATMENT OF A VACCINATED HERD.

If the serum is pure and potent and the vaccination is done properly, the treated animals will seldom miss a feed. Usually, however, the serum treatment causes a slight febrile reaction and the temperature may vary several degrees from normal for a period of days, sometimes going to 105 degrees or even higher. Within from six to ten days the animal should return to normal conditions, with temperature at about 103 degrees.

If a hog becomes noticeably sick after vaccination the chances are that either an insufficient dose of serum has been given, or the potency of the serum is not as high as it should be. Avoid turning hogs into muddy, dirty or filthy lots after they are injected. The very worst place to vaccinate hogs is in the barn and the most dangerous place to turn them after they are treated is in a barn yard where they have access to manure. If they are not kept away from filth and manure the losses from tetanus ("lock jaw") and septicaemia ("blood poison") is likely to be heavy. Best to turn them out to pasture. If abscesses form, it indicates that the proper cleanliness and care has not been exercised in the work. When abscesses do form they should be lanced and the wound washed once daily with one tablespoonful lysol to one quart of warm water.

CAUSES OF FAILURES FROM SERUM TREATMENT.

The few failures or unfavorable results which have been reported may be attributed to one of the following three causes:

- (a) Underestimating the weight of hogs.
- (b) Treating sick hogs with well hog doses.
- (c) Treating chronic cholera.

Whenever you underestimate the weight of a hog you fail to give a sufficiently large dose of serum to protect him from the virus administered. Here I desire to re-emphasize what has been stated many times before. *Give enough serum.* Don't cut the dose down 10 c.c. in order to save 15 cents, for in so doing you may be killing a hog worth \$25. Don't treat sick hogs with well hog doses. Sick hogs require double doses. The only way to determine the fact of sickness is to take temperatures. If temperature is over 104 the hog is already infected. Into such a hog you are supposed to put a double dose of serum and no virus. To those showing a temperature of less than 104 degrees give the simultaneous treatment. There is nothing quite so important in vaccinating hogs as taking temperatures. You may expect to lose from 25 to 35 per cent of sick hogs treated even

with double doses. Of course this applies to acute cholera—hogs which have not been sick over eight days. Don't treat chronic cholera, as it is a useless waste of serum. If a hog has been sick over eight days serum even in double doses will do it no good. It is well also to remember that in chronic cholera the fever has oftentimes dropped down to normal or even below normal. In such cases the thermometer cannot be depended upon for diagnosis. After the ulcers form on the intestines (eight days) a hog will die as quick with serum as without it. *Don't treat chronic cholera.*

CONCLUSION.

In this great fight of science against hog cholera science will prevail and hog cholera will be as surely conquered by anti-hog-cholera serum and modern sanitation as night follows the day. The slogan should be, "All pull together for the eradication of hog cholera." When science and effort have caused hog cholera to vanish from the confines of the Volunteer State, then we will be a happier, better fed, more prosperous and better contented people.

Additional copies of this Bulletin will be furnished free upon written request to

STATE OF TENNESSEE

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